MiSTEM Network

Place-Based Education

STEM Focused Cultural Competence Inventory – An Implementation Tool for School Leaders

Inquiry-based research supported by culturally relevant teaching increases the interests of minoritized students' who are underrepresented in the fields of science, technology, engineering and mathematics*. Educators can develop new competencies and teaching strategies to effectively engage the nation's fluid populations in STEM learning. The purpose of the STEM-Focused Cultural Competence Inventory is to assist teachers in considering their awareness, knowledge and skills regarding inclusive educational implementations with the overarching goal of recognizing how educators can become effective transformative classroom leaders in diverse environments.

Directions: Read each question/statement, then select the appropriate column that follows. As you go through the inventory, notice the number of times you choose "Strongly Disagree," "Disagree," "Agree" and "Strongly Agree."

ASSIGN THE FOLLOWING POINTS TO EACH RESPONSE:

1 = Strongly Disagree **(SD)**, **2** = Disagree **(D)**, **3** = Agree **(A)** and **4** = Strongly Agree. **(SA)**

Tally your points and divide by number of answered items.

This inventory tool is intended to heighten awareness and sensitivity to the importance of STEM-focused cultural competence. It provides concrete examples of the kinds of beliefs, attitudes, values and practices that foster STEM-focused cultural competence. Statement rationales are provided.

If you frequently responded "strongly disagree" and "disagree," your views may not necessarily demonstrate the beliefs, attitudes, values and practices that promote cultural competence within our fluid educational settings.

*(Ladson-Billings, 1994, 2014; Nieto, 2000; Gay, 2000, 2002).

southeast michigan stewardship coalition
growing visionary educational communities

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS	SD	D	A	SA
01. I have created opportunities for teachers to perform community-based research, increasing students' funds of knowledge, allowing educators to present cultural knowledge in class.	1	2	3	4
02. I have provided informal science education or out-of-school time for teachers to facilitate STEM opportunities for diverse students to experience and learn about science.	1	2	3	4
03. Inquiry-based instruction supported by culturally relevant pedagogy shows a positive correlation between improving STEM cultural competence and increasing students' STEM achievement.	1	2	3	4
04. STEM learning programs have been established in my school/schools allowing teachers to expand their pedagogues.	1	2	3	4
05. I have created opportunities for teachers to engage in cultural self-assessments at the personal and organizational levels.	1	2	3	4
06. I provide STEM enrichment programs such as chess, robotics, academic games and coding as additional school activities within my school/schools.	1	2	3	4
07. I regularly examine STEM student data relative to gender, race, ethnicity and language to monitor and manage equitable access and support services.	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS (CONTINUED)	SD	D	A	SA
08. I collaborate with teachers to institutionalize STEM learning and implement agreed-on goals and vision.	1	2	3	4
09. I implore educators to foster meaningful and supportive relationships with parents and families actively involving them in their students' STEM-related activities and learning.	1	2	3	4
10. STEM learning can have a powerful influence on students' self-identity.	1	2	3	4
11. I encourage teachers to raise my awareness by questioning biased assumptions or behaviors when observed in our environment followed by taking action to positively address those assumptions or behaviors.	1	2	3	4
12. Informal science education programs improve youths' attitudes about science and academic achievement, positively influencing their critical thinking skills and behaviors, technology and study skills, classroom behavior, and academic pursuits and career goals.	1	2	3	4
13. Minoritized students are underrepresented in STEM fields.	1	2	3	4
14. My school curriculum ensures all students will be able to master basic STEM concepts, including computational thinking, and to become digitally literate.	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS (CONTINUED)	SD	D	A	SA
15. Students should see cultures similar to their own within their curriculum.	1	2	3	4
16. I contact parents and the community regularly and engage diverse stakeholders in the decision-making process affecting all school community members.	1	2	3	4
17. I often advocate for cultural competency and social justice effectively and professionally.	1	2	3	4
18. I have created a list for each STEM area, coming up with subject-specific sources of knowledge and resources from the community that will allow for culturally responsive content.	1	2	3	4
19. I have created school-wide culturally responsive instructional methods supporting STEM content areas.	1	2	3	4
20. I provide professional learning community sessions for educators to use critical self-reflection techniques to understand when some minoritized students are not responding to instruction and content.	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS RATIONALES	SD	D	A	SA
01. I have created opportunities for teachers to perform community-based research, increasing students' funds of knowledge, allowing educators to present cultural knowledge in class. **Culturally responsive school leaders draw on unique funds of knowledge as community-based knowledge improving curriculum and teacher knowledge, and shape policy and the humanization of minoritized students throughout the school.**[1]	1	2	3	4
02. I have provided informal science education or out-of-school time for teachers to facilitate STEM opportunities for diverse students to experience and learn about science. **Families value education programs that promote informal science education (ISE) or out-of-school time (OST) experiences for their children. ISE or OST organizations document, develop and improve science learning within informal environments for learners of all cultural backgrounds.**[2]	1	2	3	4
03. Inquiry-based instruction supported by culturally relevant pedagogy shows a positive correlation between improving STEM cultural competence and increasing students' STEM achievement. **Research in STEM education shows a positive correlation between improving the cultural competence of STEM education and increasing students' STEM achievement. Lipka (2005) shows significantly higher math achievement for Yupik students from Alaska when taught math using culturally based content and pedagogy compared with a control group of their peers who were taught using traditional content and methods.**[3,4]	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS RATIONALES (CONTINUED)	SD	D	A	SA
04. STEM learning programs have been established in my school/schools allowing teachers to expand their pedagogues. **Research shows that administrators can inspire teachers' own learning, instruction and student achievement.[5]**	1	2	3	4
05. I have created opportunities for teachers to engage in cultural self-assessments at the personal and organizational levels. **Critical self-reflection is a necessary first step through which school leaders recognize and discover how their institutions and practices have been oppressive to minoritized students. Supporting teachers to follow the same process will promote critical lenses toward creating inclusive learning spaces for all students.[6]**	1	2	3	4
06. I provide STEM enrichment programs such as chess, robotics, academic games and coding as additional school activities within my school/schools. **STEM teacher/facilitators play an important role in motivating students to pursue STEM courses of study in higher education that lead to STEM careers.[7]**	1	2	3	4
07. I regularly examine STEM student data relative to gender, race, ethnicity and language to monitor and manage equitable access and support services. **STEM-focused culturally competent professionals recognize the relevance of culture and adapt professional practices to meet the needs of students from all backgrounds.[8]**	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS RATIONALES (CONTINUED)	SD	D	A	SA
08. I collaborate with teachers to institutionalize STEM learning and implement agreed-on goals and vision. **STEM-focused culturally competent professionals analyze policies, procedures and programs that inhibit access and opportunity for historically marginalized students and staff and align resources to eradicate inequity in the school community.**[9]	1	2	3	4
09. I implore educators to foster meaningful and supportive relationships with parents and families actively involving them in their students' STEM-related activities and learning. **STEM-focused culturally competent professionals acknowledge and continually examine the influence of culture, race, power and privilege and how that influence manifests itself in their personal and professional decisions.**[10]	1	2	3	4
10. STEM learning can have a powerful influence on students' self-identity. **Varelas et al. (2013) state that student identity construction is the "development of reasoned, coordinated, coherent, and meaningful ways of seeing one's self in relation to communities," such as a STEM learning classroom.**[11]	1	2	3	4
11. I encourage teachers to raise my awareness by questioning biased assumptions or behaviors when observed in our environment followed by taking action to positively address those assumptions or behaviors. **STEM-focused culturally competent professionals recognize the relevance of culture and adapt professional practices to meet the needs of students from all backgrounds.**[12]	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS RATIONALES (CONTINUED)	SD	D	A	SA
12. Informal science education programs improve youths' attitudes about science and academic achievement, positively influencing their critical thinking skills and behaviors, technology and study skills, classroom behavior, and academic pursuits and career goals. **Research has proved that informal science education programs for students can affect students' attitudes toward science and their achievement in science.[13]**	1	2	3	4
13. Minoritized students are underrepresented in STEM fields. **As marginalized groups of Black and Brown people within the United States are underrepresented in STEM, school leaders must champion around increasing science education by implementing effective ways to engage students from diverse backgrounds.[14]**	1	2	3	4
14. My school curriculum ensures all students will be able to master basic STEM concepts, including computational thinking, and to become digitally literate. **Regardless of geography, race, gender, ethnicity, socioeconomic status, veteran status, parental education attainment, disability status, learning challenges and other social identities, all people deserve the chance to master STEM skills and methods.[15]**	1	2	3	4
15. Students should see cultures similar to their own within their curriculum. **Curriculum should be defined in a comprehensive and inclusive manner including content that reflects the racial, ethnic and social diversity that is characteristic of our pluralistic society and of the world dismantling old social patterns of the white middle class as the norm.[16]**	1	2	3	4

STEM-FOCUSED CULTURAL COMPETENCE INVENTORY – SCHOOL LEADERS RATIONALES (CONTINUED)	SD	D	A	SA
16. I contact parents and the community regularly and engage diverse stakeholders in the decision-making process affecting all school community members. **STEM-focused culturally competent leaders have participatory, collaborative partnerships with stakeholders and are fervent advocates for equitable access and opportunities for all.**[17]	1	2	3	4
17. I often advocate for cultural competency and social justice effectively and professionally. **STEM-focused culturally competent leaders have participatory, collaborative partnerships with stakeholders and are fervent advocates for equitable access and opportunities for all.**[18]	1	2	3	4
18. I have created a list for each STEM area, coming up with subject-specific sources of knowledge and resources from the community that will allow for culturally responsive content. **STEM-focused culturally responsive leaders can involve the community to make schooling more inclusive and humanizing for minoritized students and communities.**[19]	1	2	3	4
19. I have created school-wide culturally responsive instructional methods supporting STEM content areas. **STEM-focused culturally responsive leaders can involve the community to make schooling more inclusive and humanizing for minoritized students and communities.**[20]	1	2	3	4
20. I provide professional learning community sessions for educators to use critical self-reflection techniques to understand when some minoritized students are not responding to instruction and content. **Culturally responsive leaders develop and encourage teachers to humanize students in their classrooms.**[21]	1	2	3	4

FOOTNOTES

1. Khalifa, M. (2020). Culturally responsive school leadership. Harvard Education Press.
2. Santiago, A. (2017). Focusing on cultural competency in STEM education. Informal Science, 1-16.
3. Santiago, A. (2017). Focusing on cultural competency in STEM education. Informal Science, 1-16.
4. Lipka, J., Webster, J. P., & Yanez, E. (Eds.) (2005). Introduction: Factors that affect Alaska Native students' mathematical performance. [Special Issue]. Journal of American Indian Education, 44(3), 1-8.
5. Khalifa, M. A., Gooden, M. A., & Davis, J. E. (2016). Culturally responsive school leadership: A synthesis of the literature. Review of Educational Research, 86(4), 1272-1311.
6. Khalifa, M. (2020). Culturally responsive school leadership. Harvard Education Press.
7. Brown, A. A. (2018). White teachers of diverse stem students: learning progressions towards or away from culturally relevant stem education.
8. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
9. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
10. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
11. Varelas, M., Martin, D. B., & Kane, J. M. (2013). Content learning and identity construction: A framework to strengthen African American Students' mathematics and science learning in Urban Elementary Schools. Human Development, 55(5–6), 319–339.
12. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
13. Fadigan, K. A., & Hammrich, P. L. (2004). A longitudinal study of the educational and career trajectories of female participants of an urban informal science education program. Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 41(8), 835-860.
14. Next generation science standards. (2013).
15. The White House. (2018). Charting a course for success: America's strategy for stem education. Committee on Stem Education of the National Science of Technology Council. https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf
16. Bishop, R. S. (2015). Windows, Mirrors, and Sliding Glass Doors.
17. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
18. Mayfield, V. (2020). Cultural competence now: 56 exercises to help educators understand and challenge bias, racism, and privilege. ASCD.
19. Khalifa, M. (2020). Culturally responsive school leadership. Harvard Education Press.
20. Khalifa, M. (2020). Culturally responsive school leadership. Harvard Education Press.
21. Khalifa, M. (2020). Culturally responsive school leadership. Harvard Education Press.

ADDITIONAL NOTES